PHOTOINITIATED RADICAL POLYMERIZATION OF BIO-BASED METHACRYLATES

Veronika Strehmel[1], Markus Heinz[1], Maximilian Kepkow[1], Bernd Strehmel[1]

[1]Institute for Coatings and Surface Chemistry, Niederrhein University of Applied Sciences, Department of Chemistry, Adlerstrasse 32, D-47798 Krefeld, Germany

Bio-based monomers made from plant materials have received increased interest recently because plants are seasonal renewable although fossil resources, which are still the main source for monomer manufacturing, will be limited available in the future. Methacrylates are synthesized directly from hydroxy-substituted bio-based starting material on the one hand and from bio-based epoxy compounds that are made e. g. by epoxidation of unsaturated bio-based compounds on the other hand.[1-4] Photoinitiated polymerization of the bio-based methacrylates combines the bio-based monomers with an environmentally friendly and energy efficient polymerization method.

Ethylphenyl-(2,4,6-trimethylbenzoyl)-phosphinate (Irgacure® TPO-L) was selected as photoinitiator for the photoinitiated radical polymerization of the bio-based methacrylates. In case that the methacrylate is crystalline at room temperature and melts at higher temperature, photoinitiated polymerization was investigated at higher temperature. Photo-DSC investigation shows significant differences in the photopolymerization kinetics between the bio-based methacrylates, which are substituted with a hydroxy group or a carboxylic group in addition to the methacrylate group. The latter is bound either in the middle of an alkyl chain or at one end of a longer alkyl chain similarly to commercial dodecyl methacrylate. Furthermore, final conversion is higher for the bio-based methacrylates compared to commercial dodecyl methacrylate. This is a big benefit of the bio-based methacrylates in comparison with commercial dodecyl methacrylate. Depending on the additional substituents, the photopolymers obtained from the bio-based methacrylates are either crystalline or glass forming materials. This makes them interesting for application e. g. in coatings.

References

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